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(71) Applicant *(for all designated States except US):* DEMS ENGINEERING I/S [DK/DK]; Roeglebakken 4, DK-4320 Lejre (DK).

(72) Inventor; and
(75) Inventor/Applicant *(for US only) :* ROSENBAEK, Dan [DK/DK]; Roeglebakken 4, DK-4320 Lejre (DK).

(74) Agent: DANSK PATENT KONTOR A/S; H.C. Oerstedsvej 70, DK-1879 Frederiksberg C (DK).

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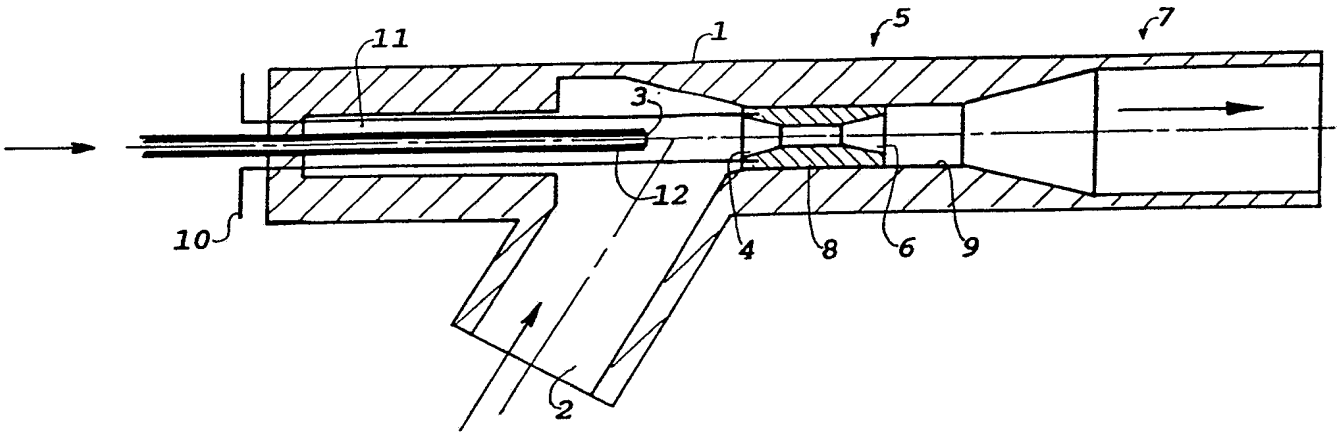

(57) Abstract

In an ejector, in which the internal diameter of the mixing chamber (5) may be changed with a view to adjustment to various working conditions, such as suction (as shown) or pumping, said internal diameter is changed by means of a sleeve-shaped insertion (8) displaceable from the position shown, corresponding to suction, to a position (not shown) in a space (11) about the nozzle tube (12). Hereby is achieved that the switching between two working positions may be carried out by means considerably more simple than the previously known means, e.g. constituted by a flexible wall of rubber or the like about the mixing chamber, the diameter of which is changed by exerting pressure on the outside of the wall.

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Switchable ejector.

TECHNICAL FIELD

The invention relates to an ejector of the kind set forth in the preamble of claim 1.

BACKGROUND ART

Ejectors are known, e.g. from GB patent specification No. 1,420,215 and the corresponding US patent specification No. 3,891,353, FR patent application No. 2,554,874 and EP patent application No. 0,142,424, in which the internal diameter of the mixing chamber may be changed by the mixing chamber being fitted with a yielding wall of e.g. rubber, which by means of adequate means may be subjected to a variable external pressure so that the wall is pressed more or less far into the mixing chamber and thereby changes the cross-sectional area of flow thereof.

For said known ejectors inter alia pressure feed means and control means are required, which result in ejectors of this kind being relatively expensive and sensitive to interruptions of work. Thus they are not suited for e.g. agricultural purposes.

DISCLOSURE OF THE INVENTION

The object of the invention is to provide the con-

struction of an ejector of the kind referred to above, which in a simple manner is constructed of a small number of components, and which is very insensitive to interruptions of work, and said purpose is achieved by an ejector, which according to the invention is constructed as described in the characterizing clause of claim 1.

The sleeve-shaped insertion or insertions, which according to the invention may be used for changing the internal diameter of the mixing chamber, may in a simple and inexpensive manner be manufactured as highly sturdy machine components and may by means of simple and purely mechanical means be moved between the various working positions.

Preferred embodiments of the ejector according to the invention, the effects of which will be explained in more detail in the following detailed part of the specification, are described in claims 2 to 7.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail below with reference to the embodiment of an ejector according to the invention shown in the drawings, in which

Figure 1 shows the ejector in a first working position or suction position, whereas

Figure 2 shows the ejector in a second working position or pumping position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For the sake of good order it is noted that an ejector according to the invention may not necessarily be constructed with mutual dimensions corresponding to the ratio of the dimensions of the drawing.

The ejector shown in the drawing, the housing of which is designated 1, comprises in a manner known in principle

- an inlet 2 for the fluid to be transported,
- a drive nozzle 3, through which the liquid driving the ejector in the form of a jet (not shown) may be directed towards the inlet end 4 in
- a mixing chamber 5, the inlet end 4 of which is connected to the inlet 2, and the outlet end 6 of which leads into
- a diffuser 7 diverging in the direction of flow, from which the liquid being transported leaves the ejector.

The novel feature of the ejector primarily consists in an axially displaceable, mainly sleeve-shaped insertion 8, which in the working position shown in Figure 1, forms part of the wall of the mixing chamber, the internal diameter of the mixing chamber thereby being considerably smaller than the diameter of a fixed wall 9 elaborated in the housing 1, to which fixed wall 9 the insertion 8 in the position shown in Figure 1 shuts tightly.

In the position shown in Figure 1, which may aptly be designated the suction position, only a narrow space is present between the internal wall in the insertion 8 and the drive jet (not shown) from the drive nozzle 3, said space being suitable for pumping out air from the inlet 2, when by means of a tube or a pipe the inlet is connected to a lower-lying quantity of liquid to be transported through the ejector.

As the air is sucked out of said pipe or tube, the liquid will rise to and fill the inlet 2 to the mixing chamber 5, in which the liquid in the same manner as

the air previously sucked out will be transported to the diffuser 7 by the drive jet (not shown) from the drive nozzle 3.

However, the course of flow through the insertion 8 is too narrow to allow the ejector to transport the liquid with a speed of volume of the order, which may be achieved by use of a mixing chamber with a larger diameter than the comparatively small diameter relative to the drive jet that is required by the transport of air. Therefore, the insertion 8 is slidably embedded in the ejector in such a manner that from the position shown in Figure 1, in which the ejector is in the suction position, the ejector may be moved away from the fixed wall 9 of the mixing chamber so that said wall, the diameter of which is considerably larger than the internal diameter of the insertion, constitutes the radial limit of the mixing chamber.

In the working example shown the displacement of the insertion 8 away from the mixing chamber 5 is effected by means of two sliding rods 10, which are secured to the insertion 8 and in a manner not shown in more detail are led tightening through the housing 1 so that they may be operated from the outside. In order to make room for the insertion 8 in the working position shown in Figure 2, which may aptly be designated the suction position, partly a space 11 is provided in the housing 1 with an adequately large cross-section to make room for the insertion 8, partly the drive nozzle 3 is elaborated at the end of a tube 12, which is so thin that as shown in Figure 2 the insertion 8 may be led in on or about the tube.

Thus in the pumping position shown in Figure 2, the ratio of the ejector between the diameter of the drive

nozzle and the diameter of the mixing chamber is suitable for transporting a relatively large quantity of liquid per time unit. As can be seen from Figure 2, the insertion 8 has been led so far back in relation to the drive nozzle 3 that the operation thereof is not noticeably disturbed.

The ejector shown may in a known manner (not shown) be connected to sensing means, whereby it can be ascertained, whether the fluid being transported is a gas or a liquid, as well as to control means for switching the ejector from one working position to another and vice versa in dependence on signals from the sensing means. If so the control means will be adapted to move the insertion 8 between the two positions shown, e.g. by being connected to the insertion by means of the sliding rods 10.

The working example shown in the drawing only comprises the two above-mentioned working positions, but it lies within the scope of the invention to construct the ejector in such a manner that it may have three or more working positions. This may be achieved by using in a manner (not shown) two or more sleeve-shaped insertions, which may be placed within one another and may be moved individually between a position mainly corresponding to the position shown in Figure 1 and a position mainly corresponding to the position shown in Figure 2. By using e.g. two coaxial insertions three working positions may be achieved, namely

- a suction position mainly corresponding to the position shown in Figure 1, in which both insertions are placed inside each other between the inlet and the diffuser,
- a first pumping position, in which the innermost of

the two insertions are led into the space 11 about the tube 12, and

- a second pumping position mainly corresponding to the position shown in Figure 2, in which both insertions are placed within one another in the space 11 about the tube 12.

The first pumping position mentioned, which operationally lies between the sucking position shown in Figure 1 and the pumping position shown in Figure 2, may e.g. be used in such cases, where the ejector is to operate against a relatively high pressure. The sensing and control means may in that case comprise a pressure sensing element placed in connection with the diffuser, said pressure sensing element signalling to the control means about the establishment of said first pumping position, when the pressure rises above a predetermined threshold value.

With a view to reducing the loss of flow the insertion 8 is in a known manner constructed with a converging inlet 4 in the flow direction and a diverging outlet 6 in the flow direction. In the above-mentioned embodiment (not shown) comprising two or more insertions, these are preferably also provided with such converging and diverging inlets and outlets, respectively, as the construction in that case may be such that various parts of the converging and diverging surfaces are placed on the respective insertions so that the loss of flow may also be kept down in e.g. the above-mentioned first pumping position.

CLAIMS

1. An ejector of the kind comprising

a) an inlet (2) for the fluid to be transported by the ejector,

b) a drive nozzle (3), to which drive fluid under pressure may be supplied, and from which the fluid in the form of a jet may flow towards the inlet end (4) in

c) a mixing chamber (5) adapted to varying its internal diameter, the inlet end (4) of which is connected to the inlet (2) and the outlet end (6) of which leads into

d) a diffuser (7), the downstream end of which forms or is connected to the outlet of the ejector,

c h a r a c t e r i z e d in

e) at least one mainly sleeve-shaped insertion (8), which may be axially displaced between a first position (Figure 1), in which the outer side is in connection with a fixed wall (9) in the mixing chamber (5), and at least one second position (Figure 2), in which the outer side is at an axial distance from said fixed wall (9) of the mixing chamber (5).

2. An ejector according to claim 1, c h a r a c t e r i z e d in that

a) the drive nozzle (3) is fitted at the end of a tube (12), the axial length of which is at least as long as the length of the insertion (8), and the outer diameter of which at the most in slide fit corresponds to the internal diameter of the insertion (8), and which is placed in a space (11), the internal diameter of which is at least of the same size as the outer diameter of the insertion (8), and in

b) switching means (10), workable from the outside, whereby the insertion (8) may be led so long on to the tube (12) that it does not noticeably effect the functioning of the drive nozzle (3) and back to said first position.

3. An ejector according to claim 1 or 2, c h a r a c t e r i z e d in that it comprises at least two mutually coaxial insertions adapted to lie within one another in at least one position of operation.

4. An ejector according to one or more of the claims 1 to 3, c h a r a c t e r i z e d in

a) that the insertion (8) or the insertion with the largest outer diameter is connected to at least one sliding rod (10), extending in the direction of displacement of the insertion and being led tightening out through the wall of the ejector housing (1), and

b) that possible further insertions with smaller outer diameters than the first mentioned are each connected to at least one corresponding sliding rod and are slidingly embedded on at least one of the sliding rods connected to the first mentioned insertion.

5. An ejector according to one or more of the claims 1 to 4 and with automatic sensing and control means for adjusting the internal diameter of the mixing chamber to the most effective dimension for the fluid concerned in dependence on the fluid to be transported being a gas or a liquid, c h a r a c t e r i z e d in that the control means are adapted to move the insertion (8) or the insertions to the position required for achieving the internal diameter in question.

6. An ejector according to one or more of the claims 1 to 5, c h a r a c t e r i z e d in that the insertion (8) or the insertions is/are constructed in such a manner that in at least one working position it/they produce(s) an inlet converging in the flow direction.

7. An ejector according to one or more of the claims 1 to 6, c h a r a c t e r i z e d in that the insertion (8) or the insertions is/are constructed in such a manner that in at least one working position it/they produce(s) an outlet (6) diverging in the flow direction.

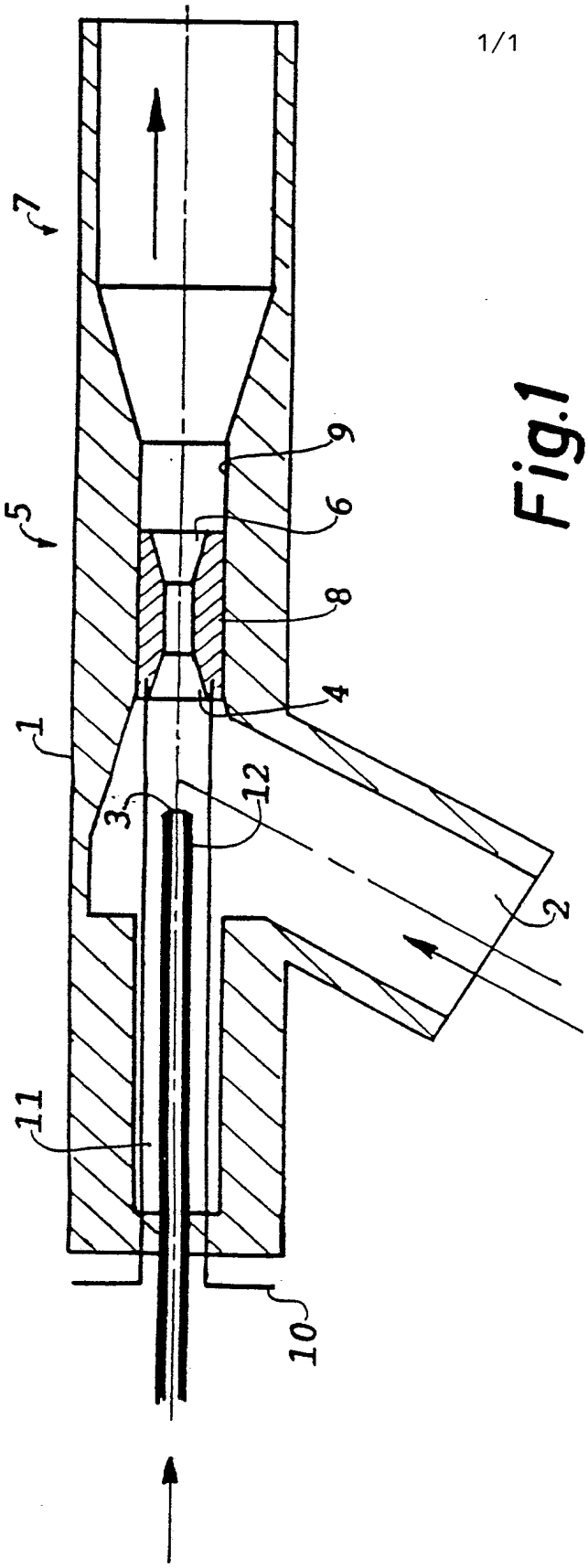

Fig.1

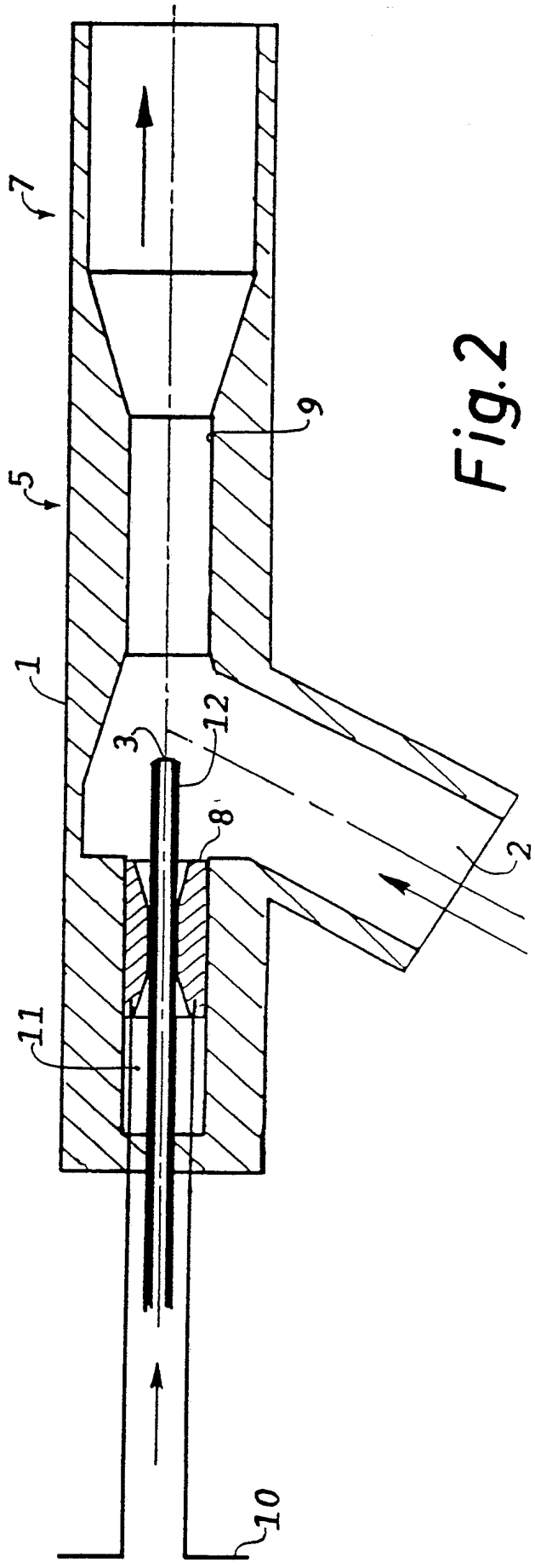

Fig.2

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK89/00020

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

F 04 F 5/48

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System [8]	Classification Symbols
IPC 4	F 04 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [9]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 2 623 474 (G. FRIEDMANN) 30 December 1952	1-7
A	US, A, 3 891 353 (TEMPLEMAN) 24 June 1975	1-7
A	US, A, 4 586 873 (LEPRETRE ET AL) 6 May 1986	1-7
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1989-05-23	1989 -05- 26
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Nils-Ivar Tjernberg